

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

To:

see form PCT/ISA/220

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2004/030385

International filing date (day/month/year)
15.09.2004

Priority date (day/month/year)
17.09.2003

International Patent Classification (IPC) or both national classification and IPC
H04L27/26, H04L25/02, H04B7/06

Applicant
INTEL CORPORATION

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☒ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1 bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2004/030385

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ in written format
 - ☐ in computer readable form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in computer readable form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
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Box No. II Priority

1. ☒ The following document has not been furnished:

☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).

☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. ☐ The International Searching Authority has not been able to consider the validity of the priority claim because a copy of the earlier application whose priority has been claimed was not available to the International Searching Authority at the time that the search was conducted (Rule 17.1). This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

4. Additional observations, if necessary:

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application,
- ☒ claims Nos. 3-8, 11-16, 19, 20, 23, 24, 27-30, 33, 34

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
- ☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):
- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
- ☒ no international search report has been established for the whole application or for said claims Nos. 3-8, 11-16, 19, 20, 23, 24, 27-30, 33, 34
- ☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:
 - the written form ☐ has not been furnished
 - ☐ does not comply with the standard
 - the computer readable form ☐ has not been furnished
 - ☐ does not comply with the standard
- ☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.
- ☐ See separate sheet for further details

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2004/030385

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has:
- ☐ paid additional fees.
 - ☐ paid additional fees under protest.
 - ☒ not paid additional fees.
2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
- ☐ complied with
 - ☒ not complied with for the following reasons:
see separate sheet
4. Consequently, this report has been established in respect of the following parts of the international application:
- ☐ all parts.
 - ☒ the parts relating to claims Nos. 1,2,9,10,17,18,21,22,25,26,31,32

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	2, 9,10, 18, 21, 22, 26, 32
	No: Claims	1, 17, 25, 31
Inventive step (IS)	Yes: Claims	
	No: Claims	2, 9, 10, 18, 21, 22, 26, 32
Industrial applicability (IA)	Yes: Claims	1,2,9,10,17,18,21,22,25,26,31,32
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item IV.

1. The separate inventions/groups of inventions are:

Group 1: Claims 1,2,9,10,17,18,21,22,25,26,31,32

Independent claim 1 relates to a method of quantizing a channel response function of a signal received from a transmitter; and generating a channel state information packet to be transmitted back to the transmitter wherein the packet includes the quantized channel response function.

Claim 2 depending on claim 1 states that the channel response function is represented by M complex numbers, limiting the channel response function to N complex numbers where N is less than M.

Group 2: Claims 3,5, 7, 11, 13, 15, 20,24,27,28,30,34

Converting the signal from a frequency domain representation of the signal to a time domain representation of the signal prior to said quantizing.

Group 3: Claim 4

Converting the signal from at least one of a frequency domain representation or a time domain representation to power allocation and modulation type instructions prior to said quantizing.

Group 4: Claims 6, 14, 19,23,29, 33

Calculating a channel response function on the signal prior to said quantizing, wherein said calculating includes subtracting a channel estimate from the channel response function to provide a residual value of the channel response function, wherein said quantizing includes quantizing the residual value of the channel response function, and wherein the packet includes a quantized residual value of the channel response function.

Group 5: Claims 8, 16

The step of quantizing includes estimating a time delay attenuation of the channel response function.

2. These groups are not so linked as to form a single general inventive concept (Rule 13.1 PCT) for the following reasons:

Reference is made to the following document:

D1: US 2003/035491 A1 (HOWARD STEVEN J ET AL) 20 February 2003 (2003-02-20)

The subject-matter of independent claims 1, 17, 25 and 31 (group 1) is disclosed and the subject-matter of independent claims 9 and 21 is rendered obvious by document D1 (abstract; paragraphs 9-13, 37-45, 57-98; Figs. 1, 2, 4, 5, 6a).

The features of dependent claims 3, 5, 7, 11, 13, 15, 20, 24, 27, 28, 30, 34 (group 2), claim 4 (group 3), claims 6, 14, 19, 23, 29, 33 (group 4) and claims 8, 16 (group 5) differ from the subject-matter of dependent claims 2, 10, 18, 22, 26, 32 (group 1).

Groups 1-5 also solve different problems:

Group 1: reducing the signalling effort.

Group 2: applying an advantageous signal processing scheme.

Group 3: obtaining system adaption parameters.

Group 4: implementing a channel estimation scheme

Group 5: improving the channel estimation

Therefore, a technical relationship involving one or more of the same or corresponding special technical features in the sense of Rule 13.2 PCT does not exist between the subject-matter of groups 1-5.

Re Item V.

1. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1, 17, 25 and 31 is not new in the sense of Article 33(2) PCT.
The subject-matter of independent claims 1, 17, 25 and 31 is disclosed by document D1 (abstract; paragraphs 9-13, 37-45, 57-98; Figs. 1, 2, 4, 5, 6a).
2. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 2, 9, 20, 28, 21, 22, 26 and 32 does not involve an

inventive step in the sense of Article 33(3) PCT.

2.1 Independent claims 9 and 21 are directed to an article comprising a storage medium having instruction stored thereon which corresponds to the features of claims 1 and 17, respectively. Therefore, the subject-matter of these claims is not regarded as being inventive in view of document D1.

2.2 Dependent claims 2, 20, 28, 22, 26 and 32 are directed to limiting the channel response function in number, which is regarded as being a matter of normal design procedure in order to reduce the signal processing effort. Therefore, the subject-matter of these claims is not regarded as being inventive in view of document D1.